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(54) Vehicle windshield wiper system with improved housing-to-frame connection.

(57) In a vehicle wiper system of the type having a frame tube (12) fixed to the vehicle body, an improved mounting of a housing (24) to the frame tube (12) includes an inwardly-tapered cradle portion (42) on the housing (24) that matches an inwardly-tapered mounting portion (30) of the tube, with deformable ribs (44) on the housing cradle portion (42) that are sheared by the tube (12) when the housing (24) is attached thereto, so as to assure solid, intimate contact between the housing (24) and the tube (12).

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VEHICLE WINDSHIELD WIPER SYSTEM WITH IMPROVED HOUSING-TO-FRAME CONNECTION

This invention relates to vehicle windshield wiper systems in general, and specifically to a system of the kind that has a tube-type frame to which various housings are mounted, as specified in the preamble of claim 1, for example as disclosed in GB-A-2 227 926.

A type of wiper system finding increasing acceptance includes an elongated steel tube fixed to the vehicle body below the windshield, which serves as the foundation or frame to which other components may be mounted. Amongst these components are various housings, such as a housing for a drive motor or pivot housings for wiper shafts. Conventionally, the motor housing is fixed to a separate bracket that is welded to the frame tube. Such a bracket provides a relatively large and flat surface to which the motor housing can be securely bolted. However, the bracket does represent an additional component, which inevitably adds cost. In addition, the high forces experienced in wiper systems, especially those with long wipers and heavy motors, require a very strong weld between the bracket and the tube to prevent metal fatigue that could result from the high operating loads. A direct connection of a housing to the frame tube could eliminate components and manufacturing steps. However, there is no immediately obvious way of securely fixing a housing, like the motor housing, to a tube of round cross-section.

A windshield wiper system according to the present invention is characterised by the features specified in the characterising portion of claim 1.

The invention provides a means for directly and securely mounting a housing to a frame tube. This is done in a way that assures intimate contact at the interface of the tube and housing, compensating for any manufacturing tolerances between the two.

In the preferred embodiment disclosed, an elongated frame tube of a relatively hard metal, such as steel, is adapted to be fixed to a vehicle body running below a windshield. Near the centre of the tube, a mounting portion is stamped into a substantially trapezoidal shape, with top and bottom walls joined by inwardly-tapered side walls. The cross-section of the mounting portion, as measured normal to the frame tube axis, is held as constant as is possible within the limitations of the stamping process, but there are some inevitable manufacturing tolerances.

A drive motor housing is moulded of a relatively soft material, such as aluminium. The housing is moulded with a integral channel portion, comprised of two pairs of opposed, inwardly-tapered, flanges. The cross-sectional area defined by the opposed flanges generally matches that of the frame tube mounting portion. However, localized projections in the form of thin ribs integrally moulded with the flange surfaces project into that cross-sectional area. Since the thin ribs are moulded of the same relatively soft material, they are deformable, if contacted under force by a harder material. The mounting means of the invention is completed by a pair of fastening bolts that pass through aligned holes in the top and bottom walls of the frame tube and thread into the housing.

To mount the housing to the frame tube, the bolt holes are aligned and the bolts threaded in to pull the frame tube between the opposed housing flanges, Given the matching cross-sections of the frame tube and the housing flanges, the harder side walls of the tube will shear and deform the thin ribs as the tube is drawn into place. The ribs are large enough to assure that they will be deformed to some extent, regardless of any manufacturing tolerances in the housing flanges and frame tube side walls. Thus, solid, intimate contact between the tube and housing is assured. Adding to the security of the connection are wedging portions near the top of each bolt which tightly enter the bolt holes in the tube top wall to bias the side walls out and into the housing flanges.

It is, therefore, a general object of the invention, in a wiper system of the type having a body-mounted frame tube, to provide a more secure and stable mounting of a housing to the tube.

It is another object of the invention to provide such an improved mounting through the co-operation of an inwardly-tapered mounting portion on the frame tube of a harder material that is bolted into an inwardly-tapered cradle portion of matching cross-section on the housing, with deformable projections of a softer material on the housing mounting portion that extend out far enough to be assured of being deformed, in turn assuring intimate contact and a secure and stable connection.

It is still another object of the invention to provide such an inwardly-tapered mounting portion on a frame tube with a upper wall and a pair of spaced side walls, and to provide the fastening bolt with a wedging portion that enters the upper wall and biases the side walls apart and into the housing to increase the solidity of the connection.

The invention and how it may be performed are hereinafter particularly described with reference to the accompanying drawings, in which :

Figure 1 is a plan view of a vehicle wiper system incorporating an improved mounting according to the present invention ;

Figure 2 is an enlarged view of the circled portion of Figure 1, with part of a frame tube broken away to reveal a housing below ;

Figure 3 is a cross-sectional view taken along the line 3-3, showing the parts before attachment ;

Figure 4 is a view like Figure 3, but showing the parts in the process of being mounted ;

Figure 5 is a cross-sectional view taken along the line 5-5 of Figure 2 ;

Figure 6 is a cross-sectional view taken along the line 6-6 of Figure 3 ;

Figure 7 is a cross-sectional view taken along the line 7-7 of Figure 4 ;

Figure 8 is a cross-sectional view taken along the line 8-8 of Figure 5 ;

Referring first to Figures 1 and 2, a vehicle wiper system incorporating a preferred embodiment of the invention is indicated generally at 10. System 10 is built on a tube frame, indicated generally at 12, which is formed from a length of round steel tubing that is bent and stamped into the various shapes desired. Tube 12 has fastening grommets 14 and 16 at the ends that are adapted to be fixed to a vehicle body, portions of which are indicated at 18. Tube 12 is thereby located below and generally parallel to a lower edge of a windshield, not shown, and can serve as the foundation to which other components may be attached. Amongst the other components are a pair of wipers 20, a drive linkage 22, and a drive motor housing, indicated generally at 24. The invention is illustrated specifically with regard to the way the drive motor housing 24 is mounted to tube 12.

Referring next to Figures 2 and 3, a part of frame tube 12 is formed into a mounting portion that has a generally trapezoidal cross-section, as measured perpendicularly to the axis of tube 12. The cross-section is comprised of a top wall 26, a substantially parallel bottom wall 28, and inwardly-tapered side walls 30. The side walls 30 are basically flat, whilst the bottom wall 28 is sprung up slightly, in its free state, so as to be spaced a distance D from top wall 26. At two axially-spaced locations, the top and bottom walls 26 and 28 are pierced by an aligned pair of bolt holes 32 and 34 respectively, the upper of which has a larger diameter than the lower hole 34, and is flared inwardly. A threaded fastening bolt, indicated generally at 36, is provided for each pair of aligned holes 32 and 34. Each bolt 36 has an upper shouldered sleeve 38 that fits through top hole 32, but not through bottom hole 34, with a tapered head 40 that fits tightly into the flared top hole 32. The length of sleeve 38, indicated at X, is slightly greater than the distance D, for a purpose described below.

Referring next to Figures 2, 3 and 6, motor housing 24, which is formed from die-cast aluminium, has two pairs of inwardly-tapered, opposed flanges 42 integrally moulded therewith. The inner surfaces of the pairs of flanges 42 are spaced apart by substantially the same amount as are the frame tube side walls 30, within the available manufacturing tolerances. The flanges 42, therefore, together comprise a channel portion on housing 24 that has substantially the same trapezoidal cross-section as that defined by the frame tube side walls 30. Integrally moulded to the inner surfaces of the opposed housing flanges 42 are localized projections comprised of parallel pairs of thin ribs 44. Ribs 44, as best shown in Figure 6, are located near the edges of flanges 42, and are sharp-edged. Given the fact that ribs 44 are thin, and integrally moulded of the same, relatively soft aluminium material, they are deformable if contacted by a sufficient force. Centred between each pair of flanges 42 is a threaded socket 46 oriented generally perpendicular to the final location of the axis of frame tube 12. Motor housing 24 also has a mounting grommet 48 integrally moulded to one side thereof.

Figures 4 to 8 illustrate how housing 24 is mounted to frame tube 12. Each pair of bolt holes 32 and 34 is aligned with a socket 46, and a bolt 36 is inserted and tightened down. This draws the frame tube side walls 30 down between the inner surfaces of the opposed pairs of housing flanges 42, in a direction generally normal to the axis of frame tube 12. Since the tapered cross-sections of side walls 30 and housing flanges 42 generally match, and since the ribs 44 extend into that cross-section, the harder steel tube side walls 30 will contact the softer aluminium of the ribs 44 and will shear and deform them progressively. Ribs 44 are high enough to assure that this contact will occur in spite of a worst-case manufacturing tolerance variation between the tube side walls 30 and housing flanges 42, but not so large that their deformation will put excessive force on the housing flanges 42. This contact and deformation is shown occurring in Figures 4 and 7. Eventually, the shouldered bolt sleeve 38 contacts the tube bottom wall 28 and flattens it out until bolt 36 and tube 12 are fully seated, and the connection is complete.

Referring next to Figures 1, 5 and 8, once housing 24 is fixed to frame tube 12, the various grommets 14, 16 and 48 are fixed to the vehicle body 18. This gives stable, three point support of the wiper system 10. More important to the invention, several mechanisms co-operate to assure that the connection of housing 24 to frame tube 12 is solid and secure. The deformation of the ribs 44 assures that there is continuous, intimate contact between the tube side walls 30 and flanges 42, much like mortar flowing out to fill the gap between bricks. The flattening of the tube bottom wall 28 by the bolt sleeve 38 assures a tensioned, rattle-free seating of the bottom wall 28. In addition, as the bolt head 40 enters top bolt hole 32 it tends to wedge the side walls 30 apart, biasing them into the flanges 42. Also, the contact between the bolt head 40 and the flared top hole 32 provides extra resistance to the tube 12 sliding axially relative to the housing 24. A secure solid connection is achieved with no extra bracketing or other fastening components between tube 12 ands housing 24.

Variations in the preferred embodiment herein described could be made. Any mounting portion on the tube 12 and channel portion on the housing with matching tapered cross-sections and with localized

projections extending into that cross-section would assure intimate contact at the connection interface. Potentially, the tube 12 need not even be hollow, although the hollow tube 12 is an advantage in that it also allows for the bolt 36 to create the tensioned, secure contacts described above. The same system could be used to mount a different housing, such as a wiper pivot housing, to the frame tube 12. The housing could potentially be moulded of any material, even a suitable plastics material, that was soft enough to be deformable when moulded into a thin projection. If the housing is die-cast, one possibility would be to mould it so that the inevitable flashing strips that form at parting lines could serve as the deformable projections. Therefore, it will be understood that the invention is not intended to be limited to just the embodiment disclosed, but has the scope determined by the following claims.

Claims

1. A windshield wiper system (10) for a vehicle, comprising: a substantially axially-extending frame tube (12) adapted to be fixed to said vehicle, said frame tube (12) being formed from a first, relatively hard, material ; a housing (24) formed from a second, relatively soft, material ; and fastening means (36) for fastening said frame tube (12) to said housing (24), characterised in that said frame tube (12) has an inwardly-tapered mounting portion (30) with a predetermined cross-sectional area as measured in a plane normal to the axis of said frame tube (12) ; said housing (24) has an inwardly-tapered channel portion (42) with a pair of sloping side surfaces defining a cross-sectional area therebetween which substantially matches that of said mounting portion (30) of said frame tube (12), said channel portion (42) further comprising at least one localized projection (44) extending into said matching cross-sectional area ; and said fastening means (36) is adapted to pull said mounting portion (30) of said frame tube (12) into said channel portion (42) of said housing (24) along a path generally normal to said tube axis, thereby causing said relatively hard mounting portion (30) to shear and deform said relatively soft localized projection (44), by virtue of said matching tapered cross-sections thereof, until said frame tube (12) is tightly seated in said housing (24), so that intimate contact between said mounting portion (30) of said frame tube (12) and said channel portion (42) of said housing (24) is assured.

2. A windshield wiper system for a vehicle according to claim 1, in which the frame tube (12) is a hollow frame tube, characterised in that said frame tube (12) comprises an upper wall (26) and a pair of side walls (30) defining an inwardly-tapered space therebetween, measured in a direction normal to said frame tube axis ; said channel portion of said housing (24) comprises a pair of sloping, opposed flanges (42) and said at least one localized projection is a thin, integrally-formed rib (44) extending from a respective flange (42) ; and said fastening means is a fastening bolt (36) adapted to pass through said frame tube upper wall (26) and into said housing (24) in an orientation generally normal to said frame tube axis so as to pull said frame tube side walls (30) between said housing flanges (42), said bolt (36) also having a wedging portion (40) located so as to enter said frame tube upper wall (26) and thus bias said side walls (30) apart and into intimate contact with said housing flanges (42).

Fig. 1.

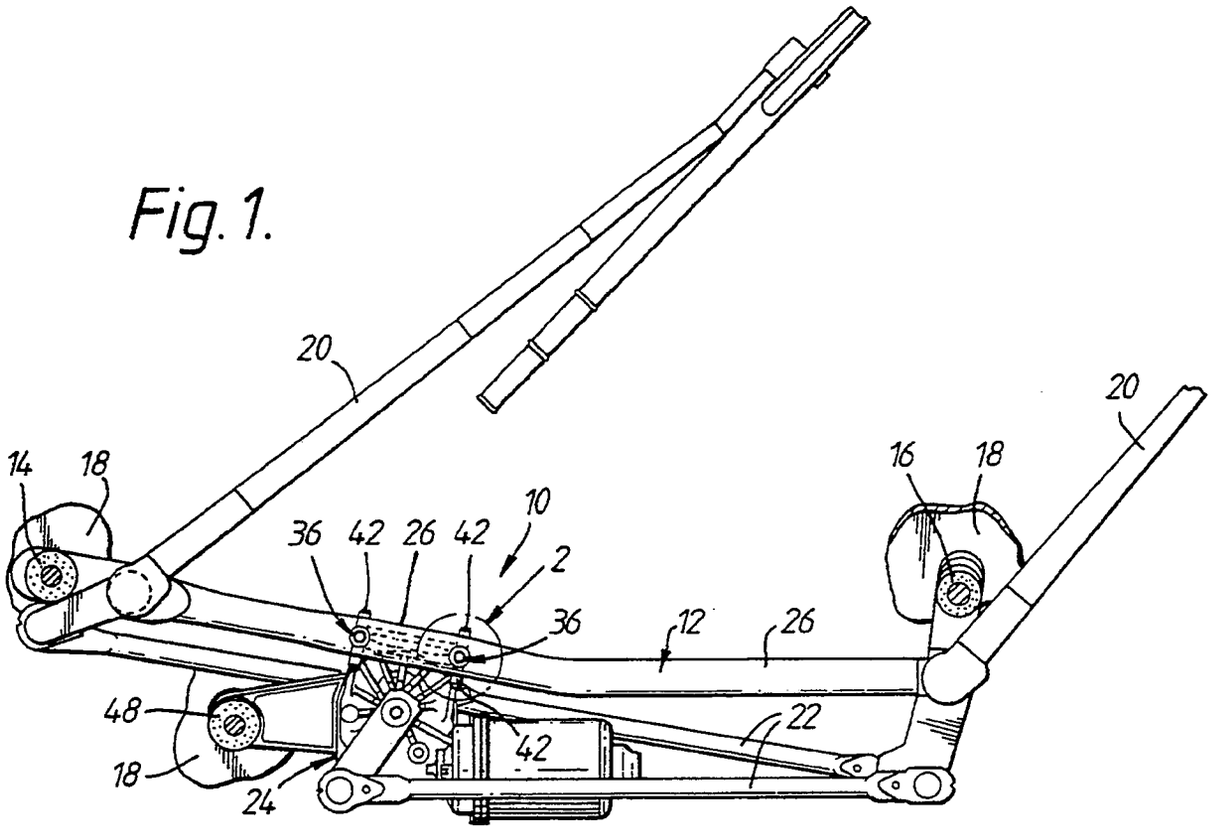
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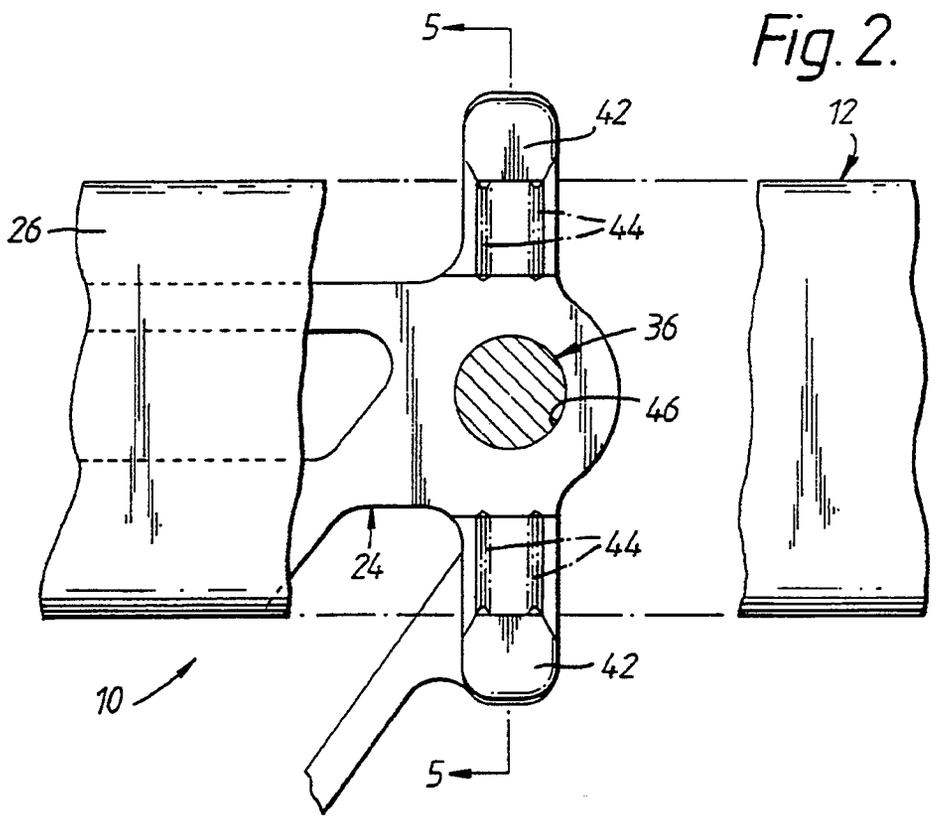
Fig. 2.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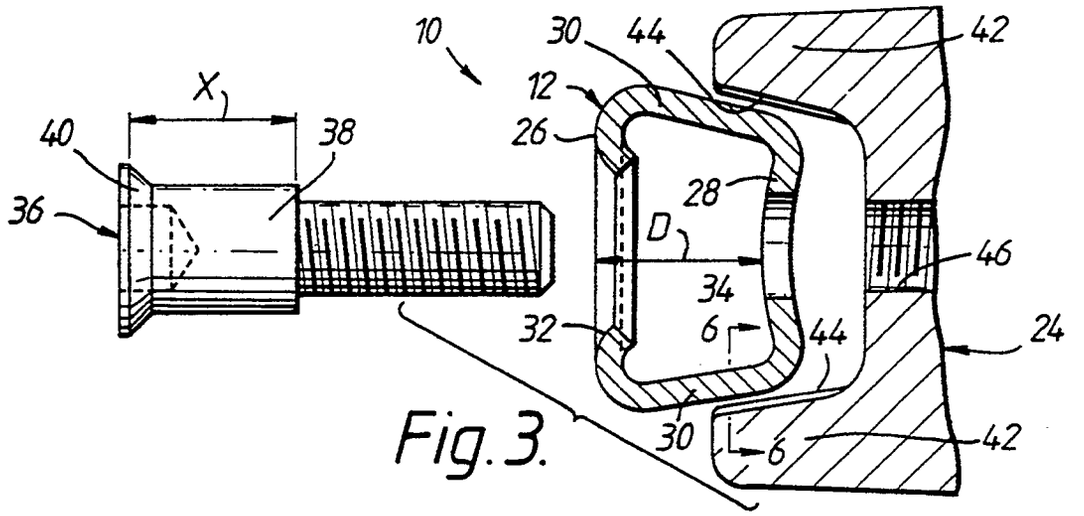


Fig. 3.

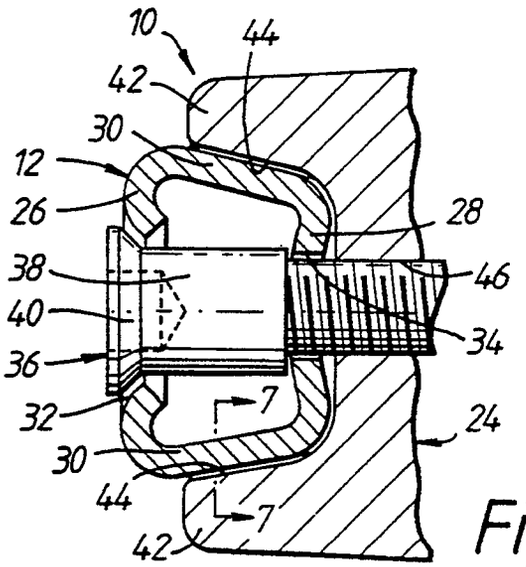


Fig. 4.

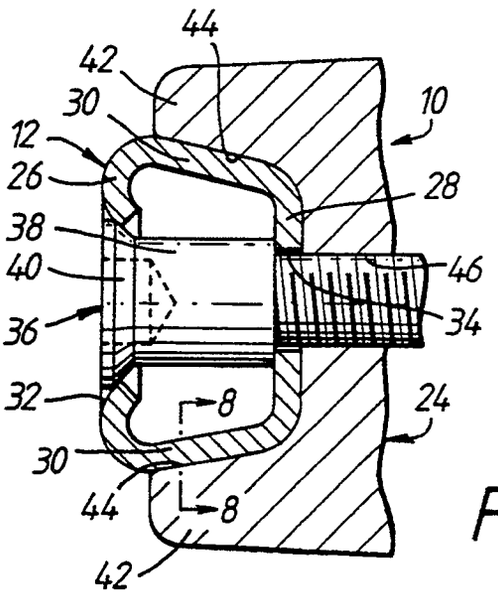


Fig. 5.

Fig. 6.

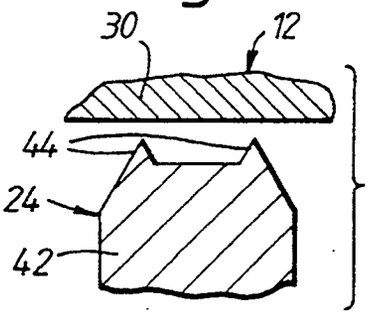


Fig. 7.

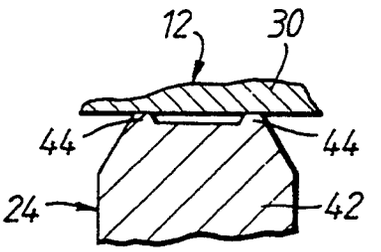
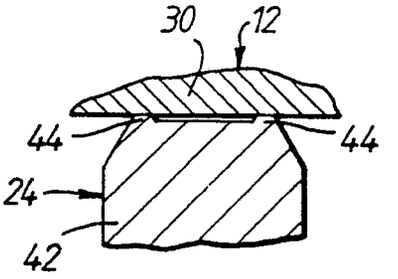


Fig. 8.



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 20 3128

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-2218622 (JIDOSHA DENKI KOGYO KABUSHIKI KAISHA) * the whole document *	1, 2	B60S1/04

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B60S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 FEBRUARY 1991	VERLEYE J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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